Gaps in SCORM Implementation and Practice Using an Online Simulation

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SI INTERNATIONAL

BACKGROUND

- Convergence of online technologies bring the need for new instructional and instructional design paradigms
- Major challenge is in the selection and application of instructional strategies to achieve higher order learning outcomes
- Drives new types of interactions and learning experiences afforded by convergence
- New approaches and models are being implemented in online learning environments
- Within the DoD one prominent approach is a simulation

SIMULATIONS FOR LEARNING

- Program that incorporates a learner-manipulated model accompanied with a learning objective that includes understanding the model (Alessi 2000).
- Confusion over scope and definition due to terminology
- Well designed simulations facilitates immersive learning, social negotiation, tool usage, and problem solving – i.e. meaningful learning
- Authentic and alternative assessment environments

PEDAGOGICAL MODELS AND SIMULATIONS

- Reusable set of specific pedagogical procedures/strategies determining how learners interact with content
- Trend is moving toward reusable models or design embodying instructional theories/strategies separated from learning resources
- Move away from content-centric approaches to goal-based models
- Simulations can be considered pedagogical models

CONNECTING SIMULATIONS AND STANDARDS

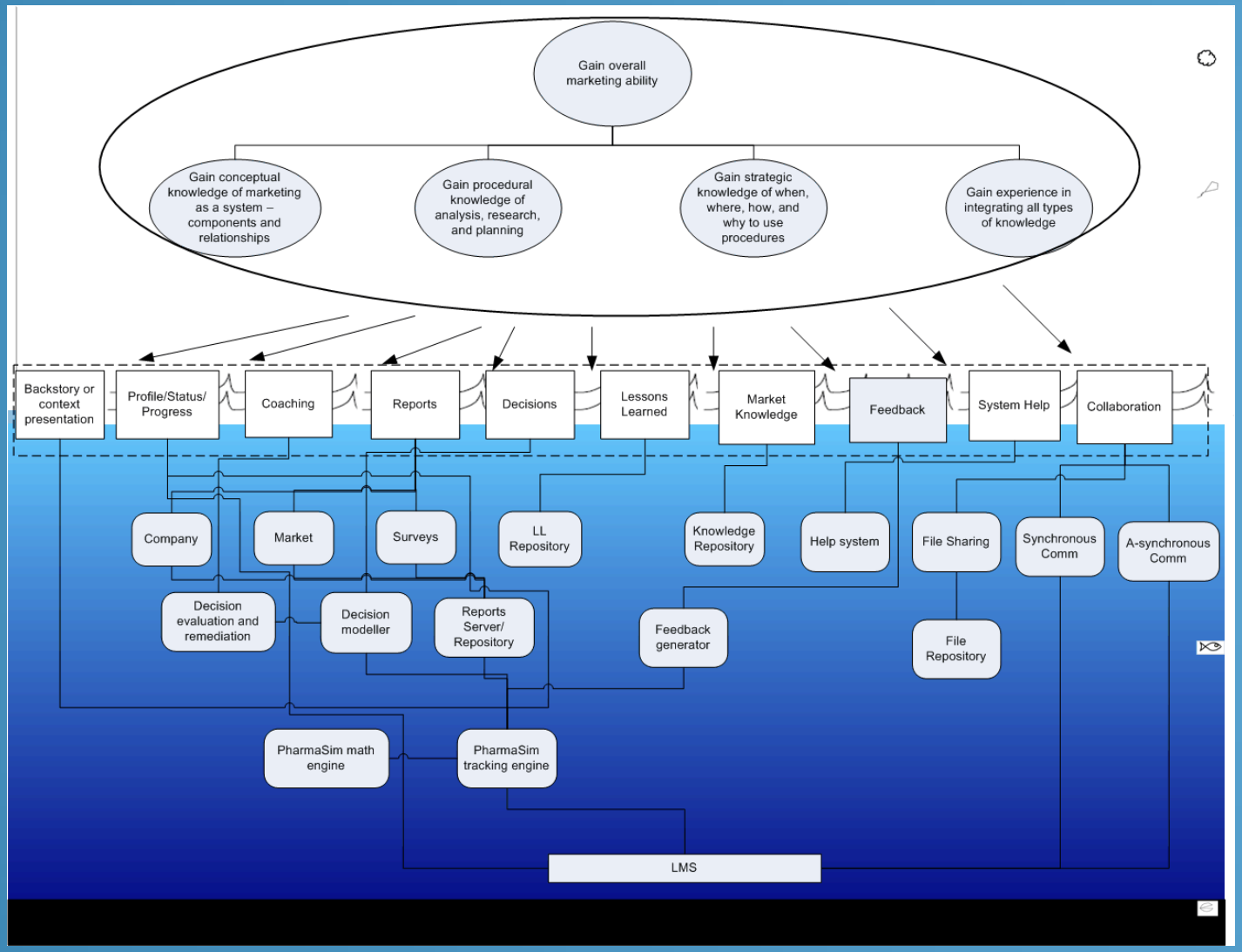
- Reusability requires standards and specifications
- Simulation standards are not designed to support individual learners or tracking and reporting
  - HLA
  - DIS
- Web standards
  - W3C
- Learning technology standards and specifications
  - IEEE LTSC, AICC, IMS, ARIADNE, SCORM
- Reusable simulation models must be supported by standards and specifications

SHAREABLE CONTENT OBJECT REFERENCE MODEL (SCORM)

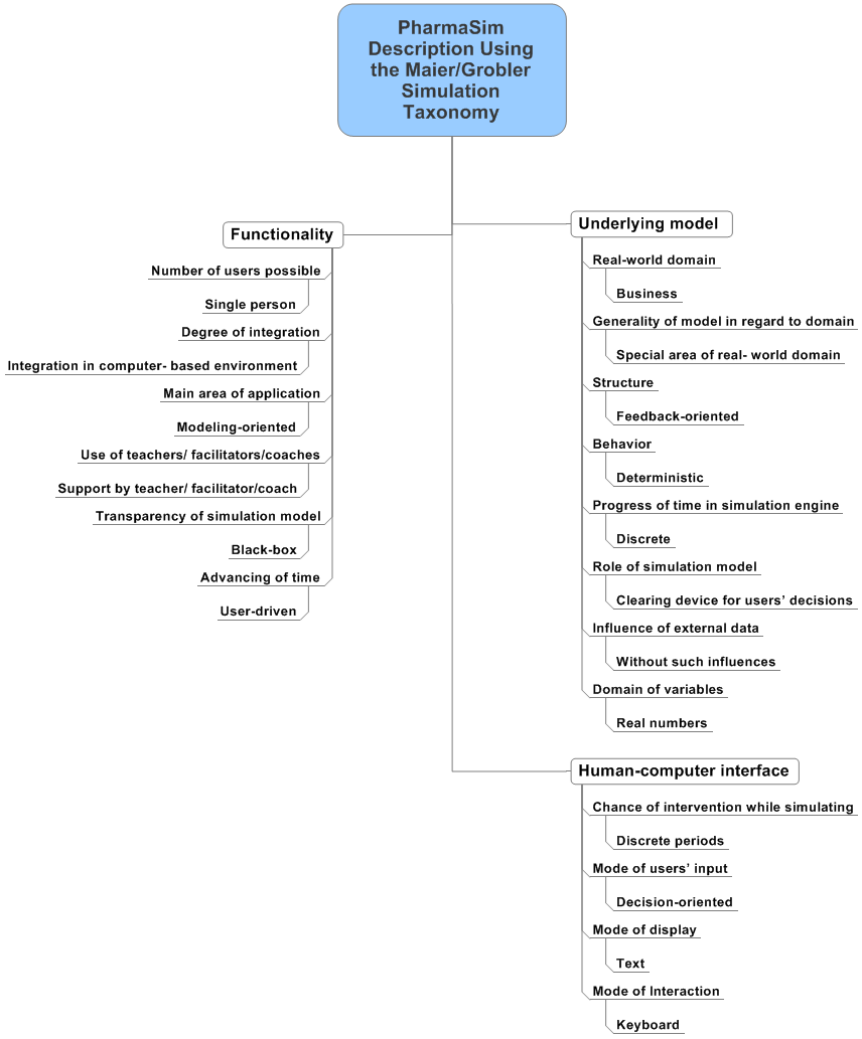
- Established framework with ubiquitous conformant content
- Critiqued for inability to facilitate learning beyond simple declarative knowledge acquisition
- Considered representative of current state of learning object content models (LOCM)
- Optimized for individualized self-directed learning with learning tracking
- Can SCORM support simulations?

RESEARCH

- Can SCORM facilitate simulations?
  - Technical Architecture
  - Implementation
- Gap Analysis
  - SCORM – condition
  - Specific simulation implementation requirements (SIMREF) optimized for interoperability and reusability – criteria
    - **PharmaSim Marketing Simulation**
    - **Use case scope diagram**
    - **8 requirements**
  - Survey methods
    - **Experienced SCORM developers from industry, government, standards/specs bodies, and academia**
    - **50 item survey relating SCORM technical categories to reqs**


Gain overall marketing ability
Gain conceptual knowledge of marketing as a system – components and relationships
Gain procedural knowledge of analysis, research, and planning
Gain strategic knowledge of when, where, how, and why to use procedures
Gain experience in integrating all types of knowledge
Backstory or context presentation
Profile/Status/ Progress
Coaching
Reports
Decisions
Lessons Learned
Market Knowledge
Feedback
System Help
Collaboration
Company
Market
Surveys
LL Repository
Knowledge Repository
Help system
File Sharing
Synchronous Comm
A-synchronous Comm
Decision evaluation and remediation
Decision modeller
Reports Server/ Repository
Feedback generator
File Repository
PharmaSim math engine
PharmaSim tracking engine
LMS

SIMREF TO SURVEY



Requirement 1: user selects their role and chooses a scenario within the simulation-based course.

Sub-level Components:

- The learner has logged on to the LMS and has chosen the simulation-based marketing course; user creates profile by choosing one of three roles and one of five scenarios.
- User role in the simulation will be progressively upgraded by default (i.e. assistant brand manager to brand manager) as determined by simulation performance, unless user disables default option.
- After making selections, user submits form.
- After submitting form, welcome page and case (scenario overview) are displayed and simulation play begins.
- It is assumed that this requirement is fulfilled by at least one dedicated SCO

Circle the number to the right of each statement that indicates your level of agreement.	1=strongly disagree 2=disagree 3=neutral 4=agree 5=strongly agree
a. SCO's are very relevant to fulfilling this requirement.	1 2 3 4 5
b. The use of one or more purely functional SCO is very relevant to fulfilling this requirement.	1 2 3 4 5
c. Updating or modifying the SCORM sequencing functionality is very relevant to fulfilling this requirement.	1 2 3 4 5
d. SCO to SCO data access or sharing of data between SCO's is very relevant to fulfilling this requirement.	1 2 3 4 5
e. This requirement can only be fulfilled by extending the SCORM 2004 in a manner other than shared data access between SCO's.	1 2 3 4 5
f. This requirement can only be met by the use of a LMS provided thick client providing communication with external systems and different LMS specific functionality.	1 2 3 4 5

RESULTS AND CONCLUSIONS

- Gaps exist in the implementation of the SIMREF with respect to SCORM 2004
  - technical architecture
  - common implementation practice
- Gaps occurred within
  - communication affordances in the RTE
  - data value/variable management
  - if-then logic within Sequencing
  - present in the common implementation practice of using SCOs purely for content presentation

TECHNICAL FINDINGS

- Not possible to meet the requirements of the SIMREF without extensions
- Extension to the RTE to include arbitrary complex data sharing between SCOs
- Extension to sequencing
  - better support the management and tracking of data values and global variables
  - inclusion of if-then logic.
- Potential standards and specifications needed
  - SSP (Shareable State Persistence)
  - DITA (Darwin Information Typing Architecture)
  - HLA (High Level Architecture)
  - SOAP (Simple Object Access Protocol)
- Other web development technologies may have potential

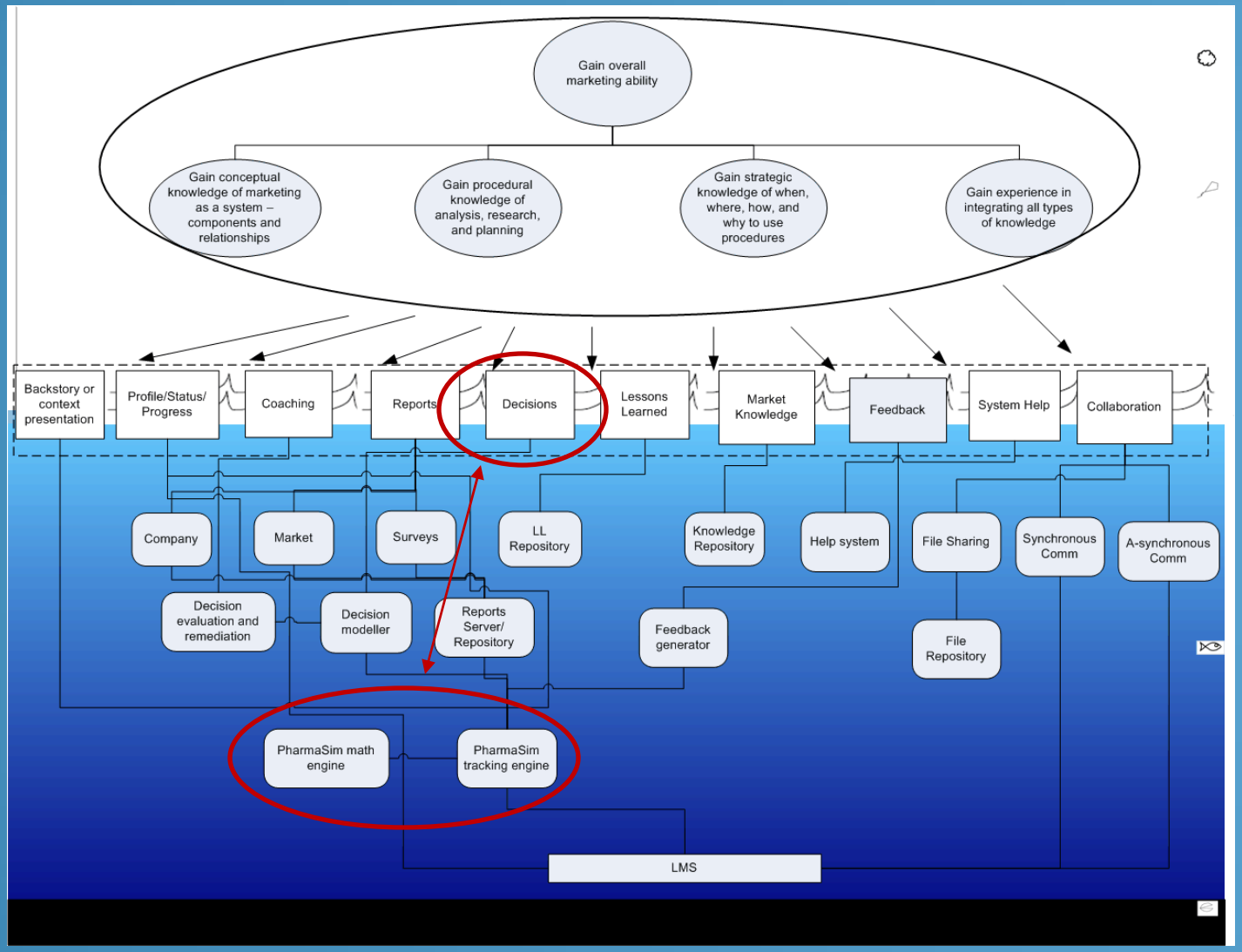
IMPLEMENTATION FINDINGS

- Functional SCOs
  - Common practice of only developing SCOs as vehicles to present content will not suffice
  - Functional or typed SCOs will be required to meet all 8 of the requirements of the SIMREF
  - Such SCOs may not actually present any content at all but may contain only programming code or functions.
  - Functionality represented within a SCO
  - Pseudo SOA – contains code for acting on incoming data and sending it back out
  - Loosely coupled
  - LMS specific thick client would not be necessary

IMPLEMENTATION FINDINGS

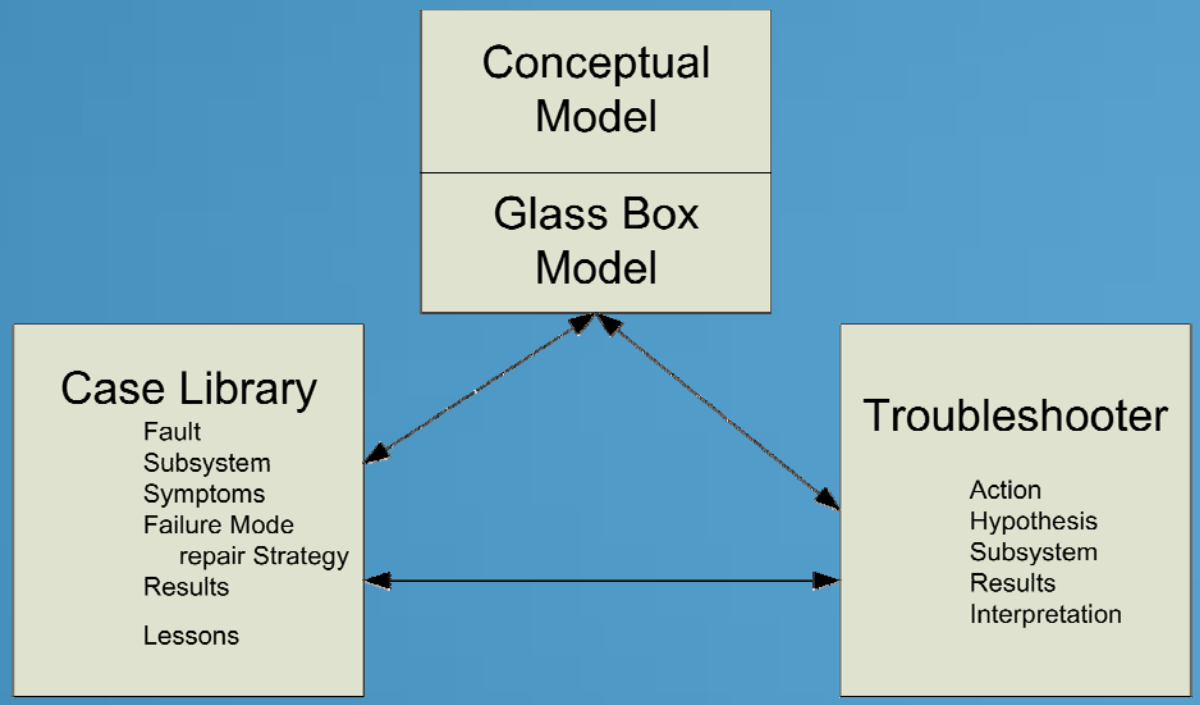
- Functional SCO example
  - Req 1 – Data flows as input and output from an embedded simulation
  - SCO contains a simulation engine
  - Processes “what if” data and actual decision data from learner
  - What if impact data is available as output to other systems that may display the impact data to the user to evaluate potential decisions or perform other functions
  - Decision data (impacts simulation state) is available as final results to other systems for evaluation and display to the learner

IMPLEMENTATION FINDINGS



IMPLEMENTATION FINDINGS

- Functional SCO Similar Model



Troubleshooting Learning Environment Model (Jonassen & Churchill, 2004)

IMPLICATIONS

- Functional SCO Downstream Effects
  - Classifying for reuse
    - **Schemas**
    - **Metadata extensions or changes**
  - Designing for reuse
    - **Granularity**
    - **Abstraction**
    - **Coupling**
  - Instructional design
    - **Will require macro level thinking**
    - **Understanding of IT infrastructure**
- Gap in ISD/IT understanding
- Need for greater collaboration with learning community for next SCORM iteration